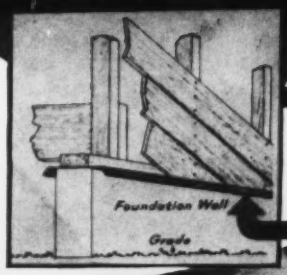
ENGINEERING NEWS-RECORD

New bridge eliminates dangerous "S" curve on U.S. 40 in Ohio — *See p. 5*

STRUCTURAL PRECAUTIONS ARE THE BEST ANTI-TERMITE WEAPONS



5' PAN STRIP SHIELD (P-60) for walls 8" or less
(SO) STRIP OUTSIDE CORNER with rounded corner
PAN CONNECTOR (PC)
(SI) INSIDE CORNER STRIP
PIER PAN—(PR) for piers 8"x8" or less rounded corners
PAN DOUBLE INSIDE CORNER (PT) for "T" wall
5' STRIP SHIELD (S-60)
STRIP CONNECTOR (SC)
PAN END (PE) half section Pier Pan
PAN FILLER (PF) available in 4" and 8" lengths
(PL) PAN INSIDE-OUTSIDE CORNER for right angle junction

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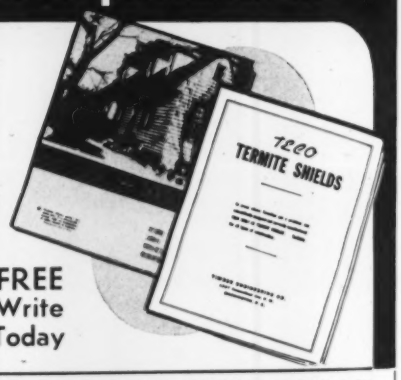

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The Week In Engineering and Construction

ENGINEERING NEWS-RECORD • DECEMBER 12, 1940

Highway research meeting centers on soil studies

Seven departmental meetings preceding the main meetings of the Highway Research Board draw a large attendance. New award inaugurated for best paper

Soil mechanics as applied to highway construction, studies of road traffic and speed tests were the subjects that developed major interest at the twentieth annual meeting of the Highway Research Board of the National Research Council held in Washington, D. C., Dec. 3-6. Other subjects covered included many maintenance and construction problems, roadside development, the national highway planning survey and pier settlement at the Baton Rouge Bridge. Governor-elect Murray D. Van Wagoner of Michigan contributed a paper on highway finance and Commissioner Thomas H. MacDonald of the Public Roads Administration presented a discussion of parking in urban areas. A new feature of the meeting was inauguration of the Highway Research Board Award which is to be made annually for the best paper among those presented during the preceding year. The first award went to Wilfred Owen, research economist, National Resources Planning Board, for his paper "Trends in Highway Finance".

Flexible type pavements

Notable agreement in results obtained through two radically different methods of approach to the question of the safe deflection of a flexible pavement under load was recorded in papers presented at the opening meeting of the design department. A. T. Goldbeck of the National Crushed Stone Association, in presenting a suggested method of design for non-rigid pavements, stated that the bearing capacity of the base must be such that the deflection of the pavement under maximum load does not exceed ½ in. This conclusion was confirmed in tests reported by Prevost Hubbard and F. C. Field of the Asphalt Institute. The Hubbard and Field tests showed that all thicknesses of sheet asphalt and asphaltic concrete pavements withstood without visible evidence of failure a deflection of ½ in. directly below the testing head.

The Hubbard and Field paper reported results obtained in a laboratory study to determine the thickness of flexible pavement required to carry traffic loads safely. Worthy of special note is the fact that failure was a punching failure in which the punched out section was nearly cylindrical. Failure of asphalt pavement under concentrated load was found to be directly dependent on the deflection produced in the pavement and not on the maximum load supporting value of the soil on which it rests.

Further data on wheel-load stress distributions under flexible type pavements was given by M. G. Spangler and H. O. Ustrud in a progress report on studies now underway at the Iowa Experiment Station.

A theoretical approach to a determination of the supporting characteristics of the subgrade was presented by L. A. Palmer and E. S. Barber of the Public Roads Administration. Its object is to provide a means whereby the characteristics of samples of soil from a proposed subgrade as found in the laboratory may be used to determine the modulus of rupture of the soil. From this the required pavement thickness can be determined without field tests.

Test of bearing capacity

Field tests on the bearing capacity of cohesive soils were reported by Fred Burggraf of the Highway Research Board staff. They show the bad effect of improper seasoning of the soil in the base, also the value of the confining action of the mat. Test devices developed for the study were described.

(*Continued on p. 11*)

Samuel H. Gottscho photo

Queens hospital wins design and construction award

The recently completed Triboro Hospital for tuberculosis in the Borough of Queens, New York City, last week was chosen as winner for excellence in design and construction for all public buildings built in that borough during the year ending Oct. 31. The award was made by the Chamber of Commerce of the Borough of Queens. The building was built by the Department of Public Works, City of New York, for the Department of Hospitals. Design was determined by functional requirements of which a major one was maximum light and air. The building is oriented to the prevailing sunlight.

John Kennedy & Co., Inc., New York City, was the general contractor; Egger & Higgins, New York, were the architects, and Elwyn Seelye, New York, the structural engineers for the project.

Prefabrication ordered for defense housing

Indian Head 650-unit project in Maryland calls for 12 different types of prefabricated construction

The Indian Head defense housing project in Maryland is to be made a laboratory of prefabricated house construction. A total of 650 prefabricated houses of as many as 12 different types will be erected—50 or so of each—to find out how well they go together, how good a house they provide, and how demountable they are. The houses will be erected by a general contractor, who will also put in streets and utilities, under the supervision of representatives of the manufacturers.

On the basis of the results obtained it will be possible to plan for the 10,000 to 12,000 demountable houses which will be included in the defense housing program. However the program is being pushed so fast that probably some other prefabricated job will get under way before Indian Head is finished. In particular, the San Diego project with 1,000 demountable units is coming along rapidly.

The Indian Head project will serve workers in the large naval powder factory on the Potomac River below Washington.

Because there is no land available in town, the project will have to be built in a field some ways out—a potential ghost town when the emergency is over. This calls for demountable construction which can be taken down and moved to a place where it is needed, and this implies prefabrication.

For the Indian Head project, a standard floor plan and elevation has been drawn up by PBA. It is for a one-story single family house about 24x28 ft. with no cellar or attic. It contains two bedrooms, living room, bath, and kitchen. The general outline is such as to give a conventional appearance, with sloping roof. Builders of prefabricated houses are now being interviewed by PBA.

In choosing types, use is being made of the advice of the Bureau of Standards, which has been testing house panels for several years. Allen Stevens of the Structural Engineering Advisory Committee to PBA is in charge of the work of prefabrication.

Pacoima Dam spillway extended

Because discharge during the floods in March 1938 caused some scour on the mountainside below the outlet, the spillway of Pacoima Dam in California has been extended to provide for discharge into the bottom of the canyon or against the opposite wall. This spillway as originally constructed consisted of a tunnel extending through the ridge against which the dam's left abutment rests, with two inlets, one at El. 1950 and the other at 1989.95, and an outlet at El. 1914.54, which is about 330 ft. above the bottom of the canyon. The present work extended the spillway down the slope to El. 1715.0.

The spillway channel is 15 ft. wide, and takes off in a box section from the tunnel; it than goes into an open section with this part of the spillway protected with a removable steel rail installed crosswise of the channel to keep out rocks and debris as shown above.

The Los Angeles County Flood Control District, Los Angeles, Calif., with H. E. Hedger chief engineer, is owner of the structure.

• • •

Large New York bus terminal planned

The Times Square Terminal, Inc., of which Harold W. McGraw, of the McGraw-Hill Publishing Co., is president, has filed a petition with the Board of Estimate, City of New York, to build and operate a $4,000,000 terminal for interstate buses. The 300,000-sq.ft. structure would be built west of the present McGraw-Hill Building between 41st and 42nd Sts. and fronting on Ninth Ave.

The terminal is to be ready for occupancy and operation within nine months after the petition has been approved by the Board of Estimate. It will rise 40 ft. above sidewalk level and extend 35 ft. below the street to provide two underground floors. The terminal is designed to handle 600 buses an hour to and from New Jersey points through the Lincoln Tunnel under the Hudson River.

Underpasses will give direct connection with the Lincoln Tunnel.

Already operators representing 60 per cent of the 2,000 buses entering New York daily from out of town have contracted to use this terminal.

Harrison & Foulihoux are architects for the work; Lockwood-Greene Engineers, Inc., New York, are the engineers.

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Priorities system to include materials for Navy contracts

No price-fixing seen necessary, but moves to inflate prices are being watched closely

Extension of the priorities system to include many of the construction materials used in Navy contracts was foreseen last week by Commander L. B. Coombs, assistant chief of the Bureau of Yards and Docks, speaking in Washington before the annual meeting of the Producers Council. Few serious difficulties in material procurement have been experienced yet, but the commander is convinced that with the expanding military, industrial, and export demand some shortages are inevitable.

No priorities are now granted on construction contracts as a whole; Commander Coombs sees no need for this, since the bulk of things needed will always be readily available. However priority ratings can be attached to orders for materials if they are on a special and secret list of so-called critical items. Construction materials are not now on that list.

When priorities do enter the construction field, Coombs feels, a tighter organization than now exists should be set up. Some central organization should maintain day by day information on the production situation of every material producer to see that orders are routed to the source that can provide quickest delivery.

Commander Coombs stressed that the Navy is not committed to any particular materials, and that any time shortages or high prices show up in one it is prepared to switch to an alternate. He said that practically all the yards and docks projects are far ahead of schedule; some of the most difficult jobs in the Pacific will be finished six months to a year ahead of time.

Col. M. B. Birdseye, executive officer for General C. B. Hartman, constructing quartermaster, expressed the opinion that no price-fixing on any material used by that organization appeared necessary thus far, but that any tendency to inflate prices was being watched closely.

Material producers cooperating

High army, navy and other government officials said that building material producers had cooperated very effectively and satisfactorily in the defense housing program. Some local distributors have, according to some of these officials, not shown the same spirit.

W. E. Reynolds, Commissioner of Public Buildings, told the meeting that inflated prices for materials and supplies needed in the housing program might delay this work. He is confident that all important interests in the building supply business understand the situation and will cooperate in preventing undue increases.

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Fire from salamander destroys building forms

Formwork for the $5,000,000 building for the Northwestern Institute of Technology, Evanston, Ill., about 30 per cent completed, was damaged Dec. 2 by fire caused by a salamander, which ignited a canvas enclosing concrete work. Damage, estimated at more than $250,000, to be borne by the contractor R. C. Wieboldt Construction Co. Forms for the north and east sides of the structure were burned before the fire could be extinguished by local and Chicago engine companies. About two-thirds of the formwork was destroyed.

• • •

New York's Sixth Avenue subway completed

Next Sunday the new Sixth Avenue subway in New York City will be placed in service as part of the Independent Division (commonly known as the Eighth Avenue) of the New York transit system. The new line, which is 2¼ miles long, cost about $46,800,000 to build and about $6,600,000 to equip. Cars required for operation of the new line added about $6,250,000, making the total cost about $59,650,000 or between 26 and 27 million dollars a mile.

The line extends from 4th St. to 53rd St., where it connects with the cross-town tube linking the borough of Queens route with the Eighth Ave. line. The new subway will make possible additional express service for the Bronx, the borough of Queens, and the Washington Heights area in Manhattan.

Ground for the new subway was broken Mar. 23, 1936. Construction was described in detail in an article "New York's Toughest Subway Job," *ENR*, May 6, 1937, p. 655. Work was greatly complicated by the necessity of underpinning the old Sixth Avenue elevated.

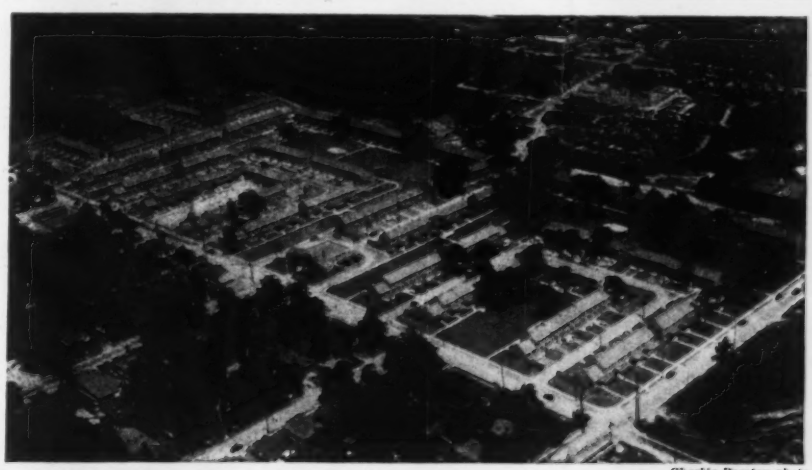
• • •

Six die in New York World's Fair demolition

Six workmen died, two instantly, as a result of an accident when the railroads exhibit was being demolished Dec. 4 at the New York World's Fair. The men were removing a false ceiling when the ceiling or its hanger supports gave way; they fell about 50 ft. to the floor of the building along with a large amount of plaster, wire mesh, and framing.

After an investigation of several hours, the assistant district attorney of the Borough of Queens announced that there was no evidence of criminal negligence.

The demolition work was being done by Wreckers & Excavators, Inc., New York City.



Charlie Preston photo

Chattanooga low-rent housing project completed

Known as the East Lake Courts project and providing for 437 dwelling units, a $1,500,000 housing project has been completed at Chattanooga, Tenn. Built by the Chattanooga Housing Authority, the work took 187 working days with 51 buildings having been built. The work covers 35 acres.

The two-story dwellings have reinforced concrete frames, 13-in. masonry exterior walls, tile roofs, steel sash, steel stairs and tile interior partitions. Floors are asphalt tile with linoleum floor covering. Mark K. Wilson Co., Chattanooga, was the general contractor, and Selmon T. Franklin architect.

Parade Studios photo

Dies in plane crash

Wilbert J. Austin, president of the Austin Co., Cleveland, was among the victims in the airliner which crashed at Chicago Dec. 4. His company had designed and erected nearly 6,000 industrial buildings in the United States and 23 foreign countries.

Austin, following graduation from the Case School of Applied Science in 1899 and a year's travel and study abroad, joined his father in the building field. One of the earliest patrons of commercial air services, he had flown more than half a million miles in transport planes.

Chicago to build its first superhighway

Construction of the first unit in a city-wide express highway program for Chicago is to start next year. Completion of the proposed 8-mi. highway extending from Grant Park on the east to the city limits on the west, is scheduled for 1945, Philip Harrington, commissioner of subways and superhighways, has announced. (For details of superhighway plan see *ENR* Nov. 23, 1939, p. 696.)

Financing of the initial work will be on a pay-as-you-go basis from motor fuel tax revenues contributed jointly by the city, Cook County, the state of Illinois, and the federal government.

Selected for initial construction is the section of the West Superhighway from State St. to Ashland Ave., which it is estimated will cost $16,000,000, and which can be completed and put in operation early in 1943.

The highway is to be an eight-lane road throughout, separated by a median strip. With the exception of the downtown terminal area, where traffic will be at grade, and a section of one-half mile adjacent to the river bridge, the highway will be of the "depressed" type.

JOBS OF THE WEEK

AIR CORPS HANGARS, Howard Field, C.Z.

N. P. Severin Co., Chicago, Ill., was awarded a $1,450,799 contract on a cost-plus-fixed-fee basis by War Department, Washington, for constructing air corps hangars at Howard Field.

AMMUNITION DEPOT, Ravenna, O.

War Department, Washington, D. C. awarded a $5,000,000 contract for constructing and operating an ammunition depot, to consist of widely scattered small buildings and underground vaults, to the Atlas Powder Co., Wilmington, Del. Construction work will be done by Jennings-Lawrence Co., Columbus, Ohio; plant will be operated under Army supervision as storehouse for ammunition assembled at the Ravenna plant. The contract for the $14,200,000 ammunition loading plant was awarded to same company in September.

JOBBING MILL, Ashland, Ky.

United Engineering & Foundry Co., Pittsburgh, Pa., will rebuild and modernize for the American Rolling Mill Company, Middletown, Ohio, a jobbing mill. Work, which is estimated to cost $1,000,000, will include installation of new rolling units.

FEDERAL OFFICE BUILDING, Arlington, Va.

George F. Driscoll Co., Brooklyn, N. Y., received a $2,589,420 contract for constructing federal office building Number 2 for Public Buildings Administration, Washington, D. C.

HOUSING, Aberdeen, Md.

Irvin & Leighton, Philadelphia, Pa., were awarded the contract for constructing a $6,000,000 housing project at the Aberdeen Proving Ground for the Public Buildings Administration, Washington, D. C.

PANAMA CANAL LOCKS EXCAVATION, Panama Canal

Martin Wunderlich Company, Jefferson City, Mo. and Okes Construction Co., St. Paul, Minn., were low bidders for the land excavation for the Panama Canal third set of locks with a bid of $8,517,100 when bids were opened Dec. 4. The work includes 12,000,000 cu. yd. of excavation at the Atlantic Ocean end of the canal; it is to be completed in 960 days.

PLANT, Hagerstown, Md.

War Department awarded a $982,890 contract for constructing and operating the plant and extending existing facilities to the Fairchild Engineering & Aircraft Corp., Hagerstown, Md.

PLANT EXPANSION, Williamsport, Pa.

War Department, Washington, D. C., awarded a $1,597,491 contract for constructing the plant expansion for aviation manufacturing to the Aviation Manufacturing Corp. (Lycoming Division) Williamsport, Pa.

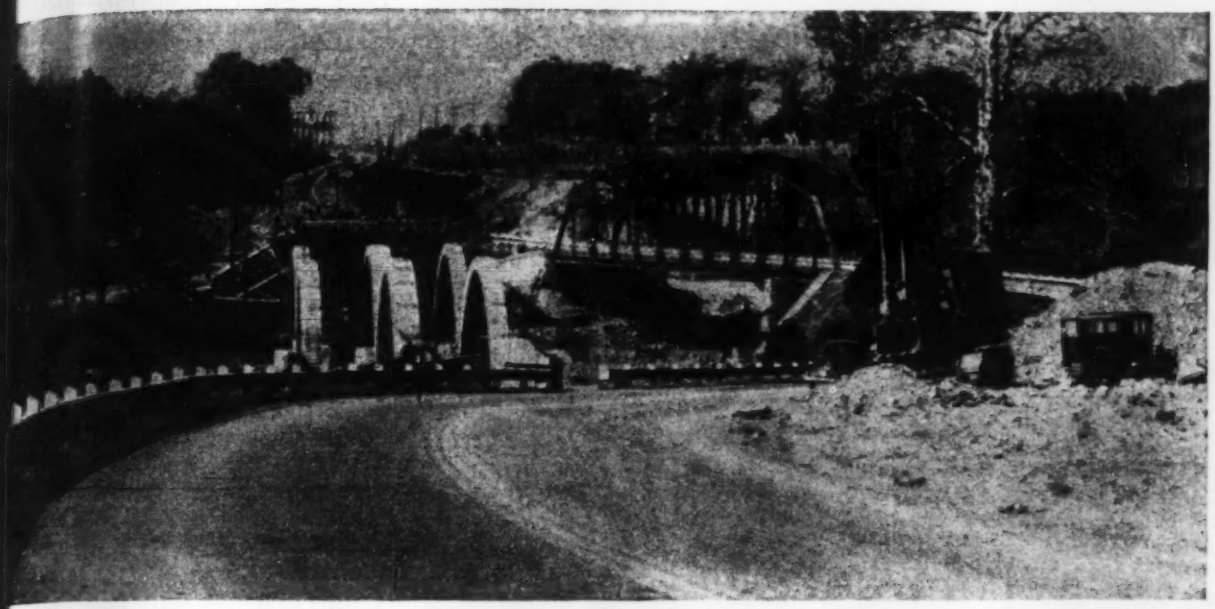
POWER PLANT, Venice, Ill.

Stone & Webster Engineering Corp., New York, N. Y., received the contract for additional power facilities for the Union Electric Co. of Illinois, East St. Louis, Ill. The work is estimated to cost $7,500,000. A similar contract was awarded to Stone & Webster last April. The present job will double the size of $8,000,000 plant now under construction.

WAREHOUSE, Philadelphia, Pa.

Wark & Co., Philadelphia, Pa., got the contract for constructing the warehouse and factory at Quartermaster Depot for the War Department, Washington, D. C. The work is to cost $9,035,000. Daniel J. Keating Co., Philadelphia, was awarded the contract for the accessories and utilities.

NOTE—Additional bidding and contract news on over 800 projects large and small appear in the Construction News Section beginning on page 16.



New bridge, to provide two 24-ft. roadways, takes shape beside old crossing with a 20-ft. roadway completed in 1914.

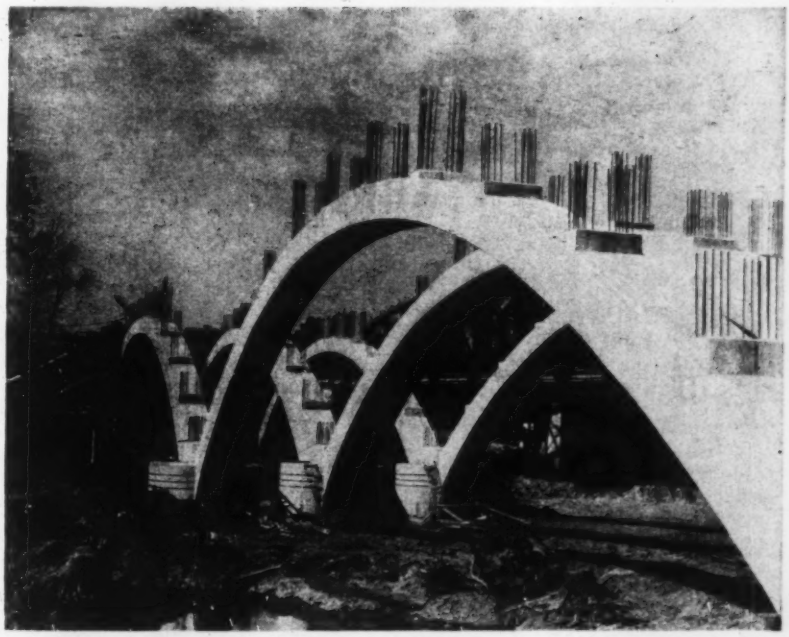
New Ohio bridge eliminates dangerous curve

cross Big Darby Creek 10 mi. west of olumbus the Ohio State Highway Depart- ent is constructing a new bridge to elimi- ate an extremely bad "S" curve on U. S. ighway 40. The work is part of a super- ighway link that includes several smaller tructures and two miles of paving.

Replacing a 250-ft. steel truss span com- leted in 1914 to provide a 20-ft. roadway, he new crossing consists of two 150-ft. span rches with three continuous deck girders each end varying in length from 28 to 35 . to make an overall length of 513.6 ft. The eck provides for two 24-ft. roadways, two -ft. sidewalks, and a 4-ft. center strip.

One set of forms was used in each span r constructing the three ribs. Five days fter concrete for the south ribs was placed, he frame-bent falsework was released, the o end panels removed to provide clearance, nd the falsework moved on greased skids y jacking 25 ft. laterally and 14 ft. forward on account of skew) to position for the enter ribs, as shown on the front cover. fter constructing these ribs, the process as repeated for the north ribs. Five men nd a foreman moved one set of centering eight hours. For the intrados and side orms ¾-in. plywood was used with plenty f allowance in the side forms for the ¼ in. of settlement which occurred at the rown when the concrete was placed. This ork was done with a crane equipped with ¾-yd. bucket.

For the highway department Hal G. ours is director; Wm. S. Hindman, bridge ngineer; T. W. Kinnear, construction engi- eer; and C. C. Hurlbut, resident engineer. ames J. Visintine is construction engineer r the bridge sub-contractor, Visintine & o., Columbus. Robert J. Dienst, Colum- us, is the general contractor for the new ighway link.



This shows completed ribs for two 150-ft. arch spans. On front cover may be seen middle ribs under construction.

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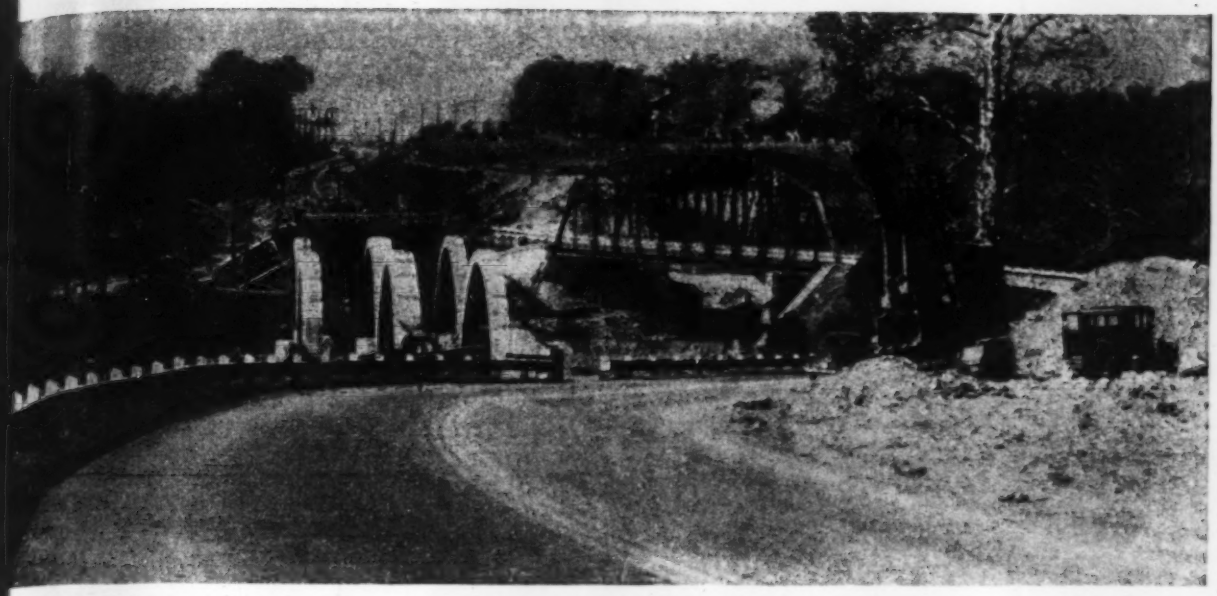

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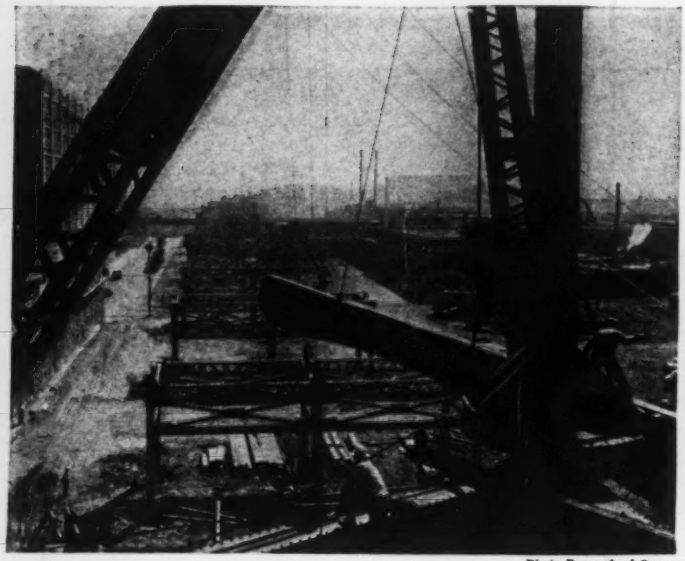
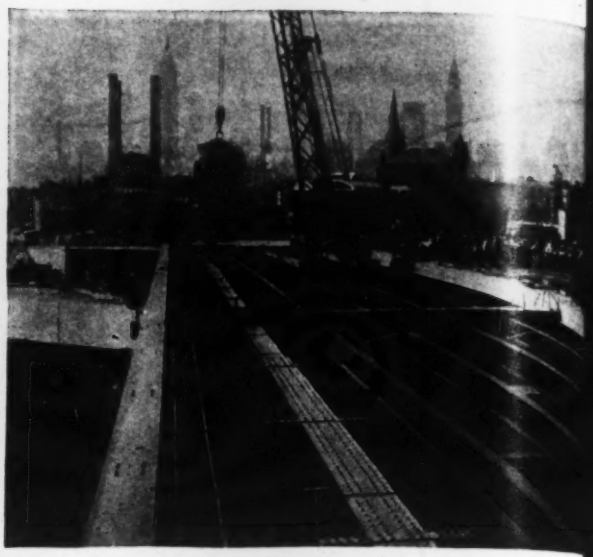


Photo Borough of Queens

Traveller erects one of three lines of girders which carry three two lane roadways.



Big crane with 3-yd. bucket transfers concrete from truck mixers to wood forms in front of finishing machine.

Paving a 4,600-ft. elevated highway in 27 day

Elevated approach to the Queens-Midtown Tunnel (upper center) crosses an industrial area and a waterway. It takes a great deal of traffic from congested Queens Boulevard and Queensboro Bridge.

McLaughlin Air Service photo

WORKING always under pressure to avoid bottleneck in opening of the Queens-Midtow Tunnel Nov. 15, the 4,600-ft. viaduct a proach connecting the Queens end of th structure with approach highways was bui in record time.

Bethlehem Steel Co., subcontractor on th steel work, started erection of the require 1,400 tons of steel on July 19, the desig being 3 lines of deck girders on tower bent The 6-lane roadway consists of two 32-f sections separated by a 5-ft. center mall an flanked by 2-ft. emergency walks on th outside.

The 10½-in. thick deck required placin 9,600 yd. of high early strength concrete be tween Sept. 26 and Nov. 13 in 27 workin days. Plywood forms were supported by system of loose cross members carried o wood runners and short verticals wedged u from the lower flange of the stringers, excep for the deep girders where beam hanger were used. Rain at the end of the perio seriously inconvenienced but did not halt th work as welding of open steel deck over section of the roadway was completed in th rain, under canvas, only 6 hours before th tunnel was opened.

The work was done for the Borough o Queens under Andrew K. Johnson, engineer of highways, and Carl Steiner, assistant engi neer in charge of the approach job. The general contract was held by Corbetta Con struction Co., New York, who executed a of the work except steel erection. Han Jacobsen was superintendent and Charle Prokop field engineer.

WASHINGTON HIGHLIGHTS

BETHLEHEM STEEL Company is starting an eight per cent expansion of its ingot capacity—providing facilities for the production of an additional 850,000 tons annually. This includes an increase in the company's pig iron and coke capacity. Other major companies are expected to undertake similar expansions soon, since the Bethlehem decision apparently ends a long dispute between the steel industry and the administration—a dispute in which the Defense Commission held a divided opinion—as to whether additional steel capacity is needed. The Bethlehem facilities, which will be amortized over five years under the new tax law, will come into operation during the second half of next year.

CONSTRUCTION of shipways and shipyard facilities to carry out the job of building a two-ocean Navy will cost $150,000,000, the Defense Commission announces. Much of this money has already been appropriated, but more will have to be included in forthcoming Navy appropriations.

EARLY ACCEPTANCE is in sight by the Navy and less probably by the Army of the design of underground aviation storage tanks submitted a month ago by the terminal engineers defense committee of the petroleum industry. These tanks, to be of 25,000 and 50,000-barrel capacity, are of steel construction and will be erected on a concrete base and covered with a 9-in. reinforced concrete slab backfilled with 4 ft. of earth.

THE WAR DEPARTMENT has named a board of civilians to provide advice on the best means of moving military equipment over the highways. Commissioner of Public Roads Thomas H. MacDonald is chairman of the group and L. S. Harris of the Association of Motor Vehicle Administrators is secretary. The committee's work will be principally to advise on the best routings and on methods of complying with state highway regulations or of obtaining exceptions from such regulations when it is necessary. It will have no connection with the current studies of defense roads on which a report is expected soon.

PRESS REPORTS of a scheme for bonus payments to cost-plus-fee contractors who save money on defense projects are somewhat premature. But such a plan may well emerge within a few weeks or months. At present the Defense Commission is making a factual study of World War experience and of present British experience. The general idea in all such schemes is that if the contractor completes a job at less than the initial estimate of cost he receives part of the saving in addition to his fee. Difficulties arise, of course, in the preparation of trustworthy estimates and in adjusting them to changes in the general price level. So far the commission has not arrived at the point of making recommendations, but it will probably do so when the studies are completed.

PUBLIC BUILDINGS ADMINISTRATION will advertise no new contracts for post offices under its three-year program, which is scheduled to wind up in July. As the first move in the President's plan for cutting down non-defense public works, the Budget Bureau has told PBA not to ask bids on any more projects. Jobs on which advertisements for bids have already gone out will not be affected. The new order will hold up about $25,000,000 worth of work which would normally have been placed under contract by the end of this fiscal year. Most of this work is already on the drafting board, and the projects will go to swell the reservoir of ready-to-go construction which the President wants to build up to combat a post-defense depression.

California highway department photo

California highway requires 400,000-cu.yd. cut

At Point Mugu where the California State Highway Commission has been improving the coast highway route some 10 mi. southeasterly from Oxnard in Ventura County nearly 400,000 cu-yd. of excavation was necessary to get the highway through a hill. When the route was laid out about 19 years ago it followed close to the ocean shore around the promontory to the left of the cut. Later, better alignment and more width called for the larger cut.

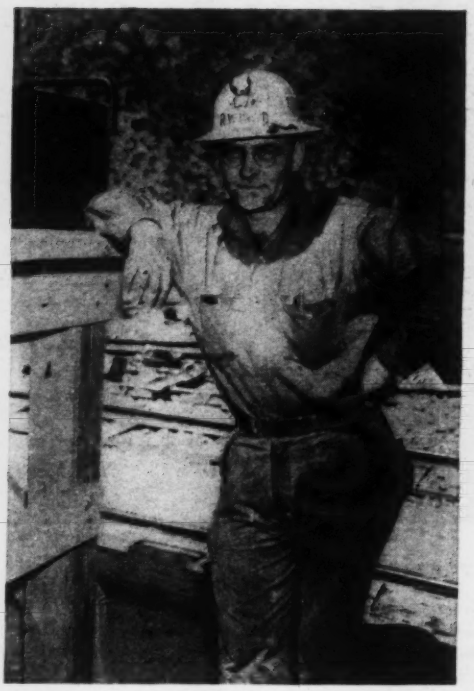
Unlike most heavy cuts, this was not a balanced job; only about 40 per cent of the excavated material was placed in new roadway embankment, though many heavy rock fragments were used to protect the ocean side of existing fill slopes or were disposed of along the outer edge of concrete sea walls that might otherwise be in danger of undermining. The cut was made by bulldozing the softer upper layers and by drilling and blasting the remainder from steep full-section working faces. Some $200,000 and 2½ years of time have been necessary in completing the last improvement.

MacDonald says access roads most urgent

Highways for national defense is the theme of the Thirteenth Annual Asphalt Conference of the Asphalt Institute which opened in Dallas, Dec. 10. A paper by Thomas A. MacDonald, commissioner, Public Roads Administration, read by E. F. Kelley of PRA at the opening session, stated that access roads to the 175 army and navy posts and camps and military industrial plants are more urgent than a strategic network of military roads at the immediate moment. More than 2,900 miles of access and reservation roads are required, which will cost $200,000,000. The job of planning these roads is now under way and a few have been started with regular state and Federal aid funds, though extra financing must be provided.

Patrick J. Hurley, former Secretary of War, stated in a talk before the conference that the only expenditures for national defense that will pay a return to the taxpayer in time of peace are those made for roads.

The conference is being attended by one thousand highway engineers, public officials, asphalt producers and technologists from coast to coast.



Known as master mechanic but really assistant superintendent, R. W. WELCH (above) is responsible for keeping Golden Cycle Corp. equipment in shape at Carlton drainage tunnel at Cripple Creek, Colo.

Professor of mechanics and hydraulic engineering and head of the department of mechanics at Cornell University was FREDERICK G. SWITZER'S title when above picture was taken. Recently, however, he resigned to become division engineer with the New York Board of Water Supply.

With an excavator in the background and a section of pipe for an arm rest, JAMES BOLTON (below), assistant director of public works at Richmond, Va., finds himself in familiar surroundings.

In recent weeks R. T. COLBURN (above), construction plant engineer, Tennessee Valley Authority, has requisitioned $1,500,000 worth of new equipment to start Cherokee Dam and expedite other emergency work required to install 300,000 kw more generating capacity for defense industries. Colburn's department has designed the plant for all TVA construction.

L. J. NEWBURG (above), chief engineer and vice president of the Gahagan Construction Corp., but at present supervising the huge dredging job of the George A. Fuller and Merritt-Chapman & Scott combination at Quonset, R. I., is an old hand at construction. He started in 1905 with W. H. Gahagan, but is also a Westinghouse-Church-Kerr alumnus.

MEN AT WORK

J. R. TORKILDSEN (left above), superintendent, and P. L. MOCCIA, president of the Moccia Construction Corp., supervised the concrete work on the Jamaica sewage treatment plant being built by the Department of Public Works, City of New York. The plant will clean up Jamaica Bay on the south shore of Long Island.

Deputy Chief Engineer HARRY SHAW (left above) talks things over with Chief Engineer HARRY R. HALL of the Washington Suburban Sanitary District as plans are being laid for major sewer and water extensions in the rapidly growing area adjoining the nation's capitol.

HERMAN KRATZ (above), recently appointed superintendent of the Anacostia River sewage treatment works at Hyattsville, Md., gets the "feel" of a main control valve at this new plant serving the Washington Suburban Sanitary District. Prior to his appointment here, Kratz was with the Baltimore, Md. Bureau of Sewers.

Despite the political turnover in city politics last summer that made front-page copy for American newspapers, T. D. SAMUELS, JR. (above), chief engineer and superintendent of the Kansas City, Mo., water department smiled through it all, for he continues in charge of supplying a good water cheaply.

JACK J. HINMAN, JR., associate professor of sanitation, University of Iowa, was on his way to work when the picture at the right was taken. He was rushing eastward from the Omaha meeting of Missouri Valley Section of the A.W.W.A. to do duty at Fort Belvoir, Va. as lieutenant colonel in the Chemical Warfare Service of the National Guard.

MEN AND JOBS

MARTIN R. ADDINGTON, surveyman, has been transferred from the Pittsburgh district office of the U. S. Engineers to Honolulu, T. H., where he will be chief of party on field surveys in connection with fortification projects.

GLENN A. RICK, a graduate of the University of Iowa, recently took over the duties of director of the Los Angeles City Planning Commission. He resigned a similar position with the city of San Diego, an office held for 11 years. The Los Angeles district has been vacant for nearly a year or since the resignation of WILLIAM N. THORPE. HUBER E. SMUTZ, chief engineer of the commission, has been acting director.

CHARLES E. ADAMS, superintendent of the Long Island and New York Zone of the Pennsylvania R.R. with headquarters at Jamaica, N. Y., has been promoted to chief engineer of those roads. He succeeds Arthur C. Watson, who died on Sept. 23. Adams in his new work will supervise grade crossing elimination projects now under way on the Long Island Lines—work totaling more than $50,000,000—as well as construction on the New York Division of the Pennsylvania. Adams, a graduate of Ohio State University, in 1929 was made superintendent of the Long Island Lines,

S. E. ARMSTRONG, who joined the New York Central R.R. in 1904, recently began new duties as engineer of maintenance-of-way of the New York Central system at New York. Armstrong joined the New York Central in 1906. In 1916 he was appointed engineer of standards at New York, a position held until his present promotion to engineer of maintenance-of-way of the system.

S. N. PEARMAN, former assistant district engineer at Florence, S. C., for the South Carolina State Highway Department, has been appointed district engineer for the Southeastern District with headquarters at Orangeburg, S. C.

LOUIS A. LUBOW, assistant chemist with the city water department at Durham, N. C., has been called to active army service and assigned to duty at Fort Benning, Ga. CITY MANAGER HENRY A. YANCEY has not as yet named a successor to Lubow's post, which will be returned to Lubow when he completes his year of training.

CARL E. RANTZOW, associate engineer, is now in direct charge of the lands section of the Houston District office of the U. S. Engineers. Rantzow, a graduate of the University of Iowa, for several years was stationed at Rock Island, Ill.

THOMAS E. WINN has been appointed WPA district engineer for District 5 in North Carolina with headquarters at Winston-Salem.

MARK E. BRADLEY, until recently with the Pennsylvania Turnpike Commission, has joined the engineering staff of the Sonman Shaft Coal Co. at Sonman, Pa. While with the Turnpike Commission he was senior inspector on work at the Sideling Hill tunnel. Previous to working with the Turnpike Commission he was engaged in general civil and mining engineering practice in the state of Pennsylvania.

F. O. NELSON, district maintenance superintendent for the Minnesota State Highway Department at Marshall, Minn., has been granted a seven months leave of absence because of ill health. E. R. BOYCE, project construction engineer in the St. Paul office, will take over Nelson's old duties,

N. P. HAYES, formerly assistant division maintenance engineer in the Green Bay division office of the Wisconsin State Highway Commission, has been elected county highway commissioner of Brown County, Wis. He fills the position left vacant by the death of George J. Cormier, who died in an automobile accident this fall. Cormier had held the position from 1913 until the time of his death.

FRANCIS R. MACLEAY, consulting engineer of New York City, has accepted the position of chief engineer for the Corbetta Construction Co. Inc., New York. The consulting work of MacLeay will be continued by his former associates under the name of MacLeay Associates. The work will be headed by CHESTER CRONQUIST.

ARTHUR T. CLARK, formerly development and sales engineer in the pipe coatings division of Barrett Co., and more recently employed on engineering development work by the American Water Works & Electric Co., has joined the Pomona Pump Co. as sales engineer. Clark once worked as manager of the Greenwich Water Co. and as chief engineer of the office of the Community Water Service Co.—a company then operating 80 properties.

THOMAS L. COCKRELL, chief of the Richmond, Va., bureau of sewers and bridges since 1929, on Dec. 1 began new duties as executive director of the Richmond Housing Authority. Cockrell, a graduate of the University of Virginia, in 1[illegible]1 was employed by the Virginia State [illegible]hway Department and in the following year entered the employ of the Richm[illegible]d department of public works in the bureau of survey and design. Two years later he was promoted to the position of progress engineer in the bureau of sewers and bridges. Following work with Stone & Webster as design engineer, he became chief of the city bureau of sewers and bridges.

MAJ. GEN. ERNEST W. SANSOM, civil engineer of the Canadian army, has been transferred back to Canada as commander of the third Canadian army division for overseas duty.

LIEUT. STAN JOHNSON, civil engineer formerly with the South Dakota Highway Planning Survey, U. S. Indian Service, and AAA, has reported for active duty at the infantry school of the U. S. Army, Fort Benning, Ga.

HENDERSON O. WEBB, JR., assistant civil engineer in the design section of the Huntington, W. Va., district office of the U. S. Engineers, was granted a leave of absence Nov. 10 for active duty as a commissioned officer in the Corps of Engineers, Fort Belvoir, Va.

COL. WILLIAM C. WEEKS of Bridgeport, Conn., who retired from active army service five years ago, has been recalled to duty and made district engineer at Jacksonville, Fla., for the U. S. Engineers. Col. Weeks takes over work handled by COL. LEWIS H. WATKINS since 1938. Col. Watkins was recently transferred to Camp Beauregard, La. Col. Weeks graduated from the University of Minnesota in 1894; he retired Oct. 31, 1935. During the interim between the transfer of Col. Watkins and the appointment of Col. Weeks, the Jacksonville district engineer office was in charge of LIEUT. COL. TATNALL D. SIMPKINS, who had acted as assistant district engineer under Col. Watkins.

ED VATH, area engineer for the Clinton, Ia., WPA office, has been transferred to the Davenport, Ia., area due to the closing of the Clinton office.

HOWARD SINDT, area engineer at Davenport, Ia., for the WPA, has become state field engineer for the eastern third of Iowa.

RICHARD MCGOWEN, engineer in the Sidney, Ia., WPA office, which has been closed, has been transferred to the Council Bluffs, Ia., area.

PAUL ROBERTS, area engineer in the Council Bluffs, Ia., office of the WPA, has become state field engineer for the western third of the state of Iowa.

Highway research men meet in Washington

(*Continued from p. 1*)

A study of pressure cells to show how closely the indicated pressures check with actual pressures was outlined by R. J. Lancaster and A. C. Benkelman of the Public Roads Administration. The authors point out that to give true values a pressure cell must deform with the soil in which it is placed, and that as all cells have rigid elements that do not deform they give higher values than actual pressures. Piston extensions and rims were used in the studies in an attempt to compensate for the effect of cell thickness.

Planning surveys

Some of the byproducts of the highway planning surveys that have been conducted by all states during the past few years and improved methods for keeping the records of these surveys up-to-date were considered at the economics departmental meeting. In a report on future use of data collected in the surveys prepared by the late J. N. Roherty it was noted that some states, notably Oregon and Connecticut, are making the fullest use of these data while others are neglecting their possibilities, especially in placing before legislators and citizen groups a sound long-term program for efficient expenditures of probable future revenues. Such a plan, the report states "is the surest safeguard against raids on highway funds by short-sighted, hard-pressed legislators."

Similar views were expressed by Burton Marye of Virginia. Marye stated that the planning surveys will be very valuable if they provide highway officials with easily understood facts with which to confront pressure groups. He also held that the surveys will give highway officials better means for determining priorities for new work. How this should be done was set forth in some detail in his paper.

Studies of congestion

A method for taking short counts of traffic that will give results closely approximating those obtained by long counts was outlined in a paper by C. W. Vickery of Texas. This stimulated considerable discussion on what constitutes a "short count" and brought forth a request that the department develop fuller information on the subject.

Along the same line was a report by L. F. Peabody and O. K. Normann of the Public Roads Administration staff on the application of automatic traffic recorders to the continuation and amplification of the planning surveys. Such counters have proved to be of great value in studying the movements of traffic congestion and in studying trends in traffic. Applying the statistics to design studies, the authors point out that for the average highway it is uneconomical to design for a greater hourly volume than the value which will be exceeded during the 30 peak hours each year and that little will be saved in construction costs and a great deal lost in expediting traffic if a design is used that will not handle that traffic volume exceeded during the 50 peak hours.

Highway finance

Murray D. Van Wagoner, governor-elect of Michigan, though not able to be present at the meeting, contributed a discussion of highway finance policies. Van Wagoner noted the decrease in local contributions to rural road costs and the shift to user revenues and federal aid. An unfortunate feature of this trend, he said, is the fact that distribution of funds remains largely in the hands of local bodies who no longer have the responsibility for raising them. He noted also that user payments are not directly reflected in user benefits because a higher percentage of the money collected goes to other than main roads.

Emergency road work

An expenditure of two billion dollars will be required to bring the 25,554 mi. of rural roads now below the standards set for our military road system up to that standard, according to H. E. Hilts of the Public Roads Administration. Emergency work to correct the worst deficiencies will require approximately $500,000,000.

High-speed in road construction will be called for on defense roads, according to H. F. Clemmer, who reported on a joint study made by the Highway Research Board and the Public Roads Administration. This need for speed, Clemmer said, calls for further study of the economics of large construction equipment.

Research in soils

Two highly mathematical discussions of stress transmission in earths opened the departmental meeting on soils, one by D. L. Holl of Iowa State College and the other by L. A. Palmer of the Public Roads Administration. They were followed by a review by D. P. Krynine of Yale of Marston's and Vuellmy's theories of culvert design which concluded that Marston's suggested basis of design is satisfactory for all practical purposes.

Turning back the pages of history to demonstrate that soil mechanics is far from being a new science, Jacob Feld, consulting engineer, New York, gave a fascinating review of experiments on lateral earth pressures during the period 1720-1920 and followed this with a brief sketch of developments since 1940. Feld concludes that so much experimental work has been done on this subject that it is now possible to formulate a set of rules that are basically true for all conditions and so can be used in the design of any engineering structure involving the necessity of determining the value of earth pressure. Feld outlined twelve such rules.

Bridge pier settlement

Highly informative records of computed and actual pier settlement at the Mississippi River bridge at Baton Rouge were given by E. L. Erickson of the Louisiana highway department. The high piers of this bridge like those of the somewhat older bridge at New Orleans are supported in river clays and silts of unknown depth, the main river piers having been sunk to great depths below river level as dredged caissons in artificial sand islands. Observed settlements have checked estimated settlements based on a very thorough study of soils in the river bed.

In checking pier elevations during high water to determine whether the piers settled as the river rose and rose again as the river fell, as had been reported at New Orleans, it was found that either that effect or the more common one of rise with rising water could be recorded depending upon what benchmark was used. This served to confirm earlier evidence that bench marks along the Mississippi are materially affected by rise and fall in the river level and so cast doubt on the results obtained at New Orleans.

In discussion of Erickson's paper, R. F. Legget, University of Toronto, paid high tribute to the bridge engineers of the Louisiana highway department for keeping such accurate records of what happens to an engineering structure after it has been built because such records permit theory to be checked against practice. Legget stated that he found himself perplexed by failure of the engineers to take skin friction on the piers into consideration in designing them. Noting that the side friction areas on such piers are much larger than the bearing areas, Legget expressed the hope that, despite the difficulty involved in determining skin friction, data on skin friction ultimately will be developed. Valuable records in India are available, he said.

G. P. Tschebotareff, Princeton, stated that differential settlement of the banks of the Mississippi had been noted at other points which has not been satisfactorily explained.

Soil in aggregates

Rejection of aggregates on the basis of the liquid limit and plasticity index of the soil in the aggregate without taking the quantity of that soil into consideration was stated to be uneconomical by L. A. Deklotz of the PRA in a paper

presented by E. A. Willis. Tests show that the bearing value of most aggregates is improved by the presence of a certain amount of fines; for quantities under that limit the soil content may have a high liquid limit and plasticity index without detriment to the material. The significance of this, said Willis, is that local aggregates that now are rejected because of the characteristics of the soil portion do not meet specification requirements may prove to be quite satisfactory as they stand or with some slight modification.

Some practical applications of abstruse physico-chemical theories as to the character of soil particles were discussed by Hans F. Winterkorn, University of Missouri. It has been found that the affinity of soils for bituminous materials can be increased by changes in the surface-chemical characteristics of the soil, thus making a more stable bituminous mixture. Studies of like possibilities in cement stabilization are now in progress.

Soil-cement roads

Results of a questionnaire on soil-cement roads sent to all state highway departments were reported by W. H. Mills, Jr., South Carolina. Of the 46 states reporting, 23 now have such roads, the total mileage being 202. All have bituminous type surfacing ½ to ¾ in. thick. The chief difficulty with such roads is in sealing the surface. A similar survey is planned in from three to five years, when it is hoped that maintenance costs will be available.

Carl R. Reid, Oklahoma, reported that a chemical method for determining the cement content in a soil-cement road was under study.

Miles D. Catton, Portland Cement Assn., in a resumé of research on the physical relations of soil and soil-cement mixtures, stated that Winterkorn's conclusions appear to find support in results given in his paper. The Catton paper, in addition to interpretation of some of the physico-chemical relations of soil and cement, included results and brief interpretation of exploratory research begun in 1935.

Modern methods for stabilizing roads with calcium chloride were reviewed by John Elleman of the Solvay Process Co. who noted that one of the major advantages of such stabilized roads is that they provide a base for a higher type road when needed. In discussion it was brought out that the use of clay with calcium chloride on stone or gravel roads has resulted in a considerable reduction in maintenance and in rutting. Methods for maintaining roads with stabilized bases were given by J. J. Forrer, Virginia Department of Highways.

Stabilization of road surfaces with emulsified asphalt was reviewed by C. L. McKesson, American Bitumuls Co. who pointed out that recent improvements in processing soil emulsion mixtures on the road, especially in drying it to optimum moisture content, have greatly improved the product. Rolling thin layers under pneumatic tires, McKesson said, gives higher densities than can be obtained with sheepsfoot rollers.

New use for pavement cores

Quality of workmanship in making concrete pavements is clearly shown by a study of cores taken from the pavements, according to W. C. Hansen of the Portland Cement Association. The study reported by Hansen was undertaken to learn more about the lack of resistance to frost action in pavements that were known to have been made with high quality materials. Cores taken from pavements where disintegration had occurred showed clear evidence of segregation, which resulted in higher absorption of moisture and less resistance to freezing and thawing.

Accelerated freezing and thawing investigations were discussed by F. V. Reagel, Missouri. No conclusions have yet been reached by the committee, but there are clear indications that loss of modulus of elasticity is a more sensitive method for testing concrete quality than is the compressive test. It is less costly than the flexure test. The range of freezing and thawing temperatures has been found to be important; also it has been noted that in the field this range in the pavement surface is much more than air temperatures indicate due to sun, evaporation etc.

Results of studies to determine the effect of grain size on frost heaving were reported by John D. Watson, Duke University. It now is possible to tell by grain size whether a soil will heave under frost action.

Soil investigations

C. A. Hogentogler, in opening the general session on soil investigations, noted that present investigations point to the need for fuller knowledge of the function of water in soil mechanics. Soil, he said, is a material that makes water depart from its natural characteristics, for example, water in intimate relation to fine particles of soil does not freeze at its normal freezing temperature. The significance of these changes, he said, have yet to be explored.

W. S. Housel, University of Michigan, expressed satisfaction over the growing evidence that soil mechanics is rapidly being divested of the mysterious erudition with which some of the earlier students cloaked it and now is becoming a normal tool of the practicing engineer.

Sidewalks on highways

There were 1,825 miles of sidewalks on rural highways in 1939, according to data collected by a committee headed by Earl J. Reeder. Its studies lead to a tentative recommendation of the standards tentatively adopted by the American Association of State Highway Officials. The study is to be continued.

A recommendation by the committee that steps be introduced in walks where the grades exceed 7 percent was questioned in discussion as unnecessary, the view being expressed that much steeper grades could be used safely and at less cost. The committee was urged to include recommendations in future reports on cost allocations and on maintenance.

Traffic studies

Consideration of traffic matters ranged over a variety of subjects, including approach speeds at intersections, traffic signal indications for pedestrians and speed studies.

A very comprehensive study of approach speeds at intersections being made by the National Conservation Bureau for a subcommittee of the Highway Research Board was the subject of extended discussion. The committee has developed a fairly satisfactory method for determining approach speeds with observers using stop watches but notes the need for automatic devices. Wide divergence of views on the value of approach-speed signs at intersections was found by the committee. Like divergence developed in the discussion. A clear indication to the motorist that he is approaching a blind intersection was held by many to be safer than a speed indication.

Traffic signals

Pedestrian signal indications were considered in two papers, one by Leslie J. Sorenson, city traffic engineer, Chicago, and one by Wm. A. Van Duzer of the Washington Department of Vehicles and traffic. Sorenson's committee in its report gives traffic code rules for behavior of pedestrians at intersections and lists four classifications of crossing where separate signals for pedestrians should be installed. The need for greater uniformity in the use of yellow indications at intersections was urged.

Speed studies

Speed studies that have been conducted in Connecticut and South Carolina were described by H. R. De Silva of the Yale Institute of Human Relations. These studies were made a few miles outside of towns using automatic speed indicators developed by the Public Roads Administration. A number of interviewers were employed to prevent unnecessary delay to people on the road. Trip distance was found to be a controlling factor in determining speed, but age of vehicle also was found to be important. Young people were not found to be fast drivers as a class, the fastest drivers being the middleaged people with high-powered cars.

Other speed studies were reported by D. W. Loutzenheiser of the Public Roads Administration and E. E. Wilson of the General Motors proving ground. The latter gave deceleration distances required for stopping vehicles traveling at 70 mph. under varying conditions. The comfort range is about 9 ft. per sec. per sec. A figure of 13.9 was found excessive and may result in injury to passengers. R. A. Moyer, Iowa State College, stated that these figures check results obtained with test cars in Iowa.

A cooperative study of speed marking on curves was reported by Moyer. It is to be extended to the Pennsylvania Turnpike this year. A ball-type bank indicator used on airplanes was used in the study and was found highly satisfactory. A ball-bank angle of 10 deg. is considered to be the limit for safe speeds. Methods for making tests and for marking curves are outlined in the report.

Safe night speeds for sealed-beam headlights were found to be the same as safe day speeds on sharp curves for speeds up to 30 miles per hour.

Airport design

Up-to-date standards for commercial airport construction were set forth by H. H. Houk, resident engineer, Washington National Airport. Houk urged the importance of long range planning for airport needs and suggested that land adjoining airports be acquired and used for playgrounds or parks until needed for airport expansion.

Highway maintenance

Warping of the edges of concrete pavement slabs was discussed by Harold Allen, PRA, and R. B. Wills, Kansas Highway Commission. Wills gave a detailed report of studies being conducted on a test road near Lawrence built in 1935. Results so far obtained show that warping is due to laying pavement on a subgrade that is deficient in moisture content, the subgrade under the joint expanding as it takes up moisture. Ultimately, the remainder of the subgrade takes up moisture and the warping disappears.

Planning for parking

Adequate provision for parking in urban areas was declared to be one of the major highway problems of today by Thomas H. MacDonald, head of the Public Roads Administration, in a report by the finance department of the research board. MacDonald suggested that cities might encourage private provision for off-street parking by elimination of fees and lowering taxes on land so used; he also proposed that cities should provide adequate approaches to private parking areas and then restrict street parking. Publicly owned land often can be used to advantage, he said, either as public or private parking. MacDonald put forward the possibility of states authorizing revenue bonds for parking facilities, also the possibility that slum clearance land being used for that purpose.

Construction of parking facilities was suggested as a possible source of normal construction after the peak of the defense program, but MacDonald pointed out that to be effective plans and arrangements for financing must be made now.

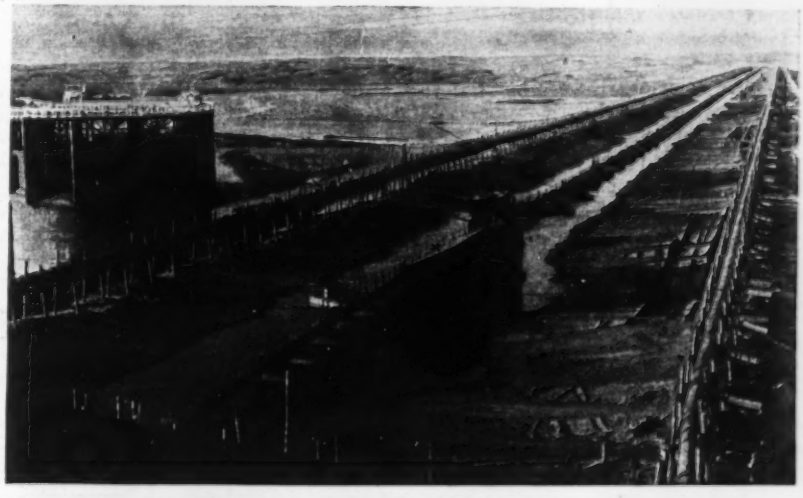
Highway lighting

Deaths between dusk and darkness on rural highways continue to increase at a rate of about 2 percent, according to Burton W. Marsh, American Automobile Assn., chairman of the committee on highway lighting, thus indicating the growing importance of that subject. The committee has made an inventory of all modern lighting installations and is now collecting data on the lighting of short sections of road where there are special hazards to determine what accident reduction had been made by lights. The committee seeks to find a section of road at least two miles long where lights are to be installed and where accident records have been kept in recent years. A careful study of driver habits on such a section before and after lights are installed will give a better measure of the value of lighting than is now available. At most points where lights have been installed, Marsh said, the pavement has been widened or the character of the highway has been so changed as to make comparisons of little value.

Studies to determine driver reactions to highway lighting, conducted by the Public Roads Administration, were reported by W. P. Walker. Drivers were found to behave very nearly to their behavior in daylight except as to their transverse position on curves on the highway. The night position is nearer the center line. Uninforced posted speed limits were found to have little effect.

Roughness indicator

A new device for checking pavement roughness that was developed recently by the Public Roads Administration was on display at the meeting. It is single-wheel trailer that measures spring deflections in passing over the pavement under study. Its design is based on experience with earlier devices of similar nature used in automobiles but it eliminates the variations in results thus obtained that were due to differences in vehicle characteristics. R. A. Moyer, Iowa, stated that the device was given a good tryout in that state this summer and was found to give just as satisfactory results as their profilometer at much greater speed and at less cost.



Dredging completed for Kingsley Dam

On Dec. 9 the work of placing 26,000,000 cu.yd. of hydraulic fill for Kingsley Dam on the North Platte River near Ogallala, Neb. was completed. The work was done by two 30-in. dredges powered with 4,000-hp. motors on the dredges and 2,500-hp. motors on boosters. It was started in the early summer of 1939 and has proceeded steadily ever since, except for an 83 day shutdown on account of severe winter weather. Actual operating time has been 15 months.

Principal dimensions of the dam, which is a full hydraulic fill, are: length on bottom, 7,500 ft.; length on top, 10,700 ft.; base width, 1,140 ft., top width 30 ft. and height 162 ft. It is being built for irrigation purposes by the Central Nebraska Public Power and Irrigation District, of which George E. Johnson is chief engineer and general manager, and George N. Carter, resident engineer at the dam. The Minneapolis Dredging Co.-Martin Wunderlich Co., George P. Leonard, general superintendent, is the general contractor. The contract price was about $5,000,000.

OBITUARY

KELLER MELTON, regional safety engineer at Chicago for the Work Projects Administration, died in a plane crash at Chicago Dec. 4. Melton, civil engineer and graduate of Emory University and Georgia Tech, had served as safety director and commodities director in Georgia for a time.

ALEXANDER MILLER MCPHEETERS, 76, former superintendent of waterworks of Raleigh, N. C., died in Atlanta, Ga., Dec. 4.

JOHN W. KELSEY, 55, former superintendent of the municipal waterworks at St. Paul, Minn., and city engineer of St. Paul from 1927 to 1930, died in Toledo, O., Dec. 6. Since 1930 Kelsey had been chief engineer of the W. W. McGee Construction Co., St. Paul.

COL. V. IRVING SMART, 66, deputy minister of the Department of Transport for Canada, died in Ottawa, Ont., Dec. 2. Smart, a graduate of Queen's University, joined the government service in 1898 as surveyor and left in 1900 to spend the next seven years in the service of several American railroads. Returning to Canada, he was appointed professor of railway engineering at McGill University, serving until 1914. After the World War he was appointed consulting engineer with the Canadian federal department of railways and canals. When the federal government reorganized some of its departments and formed the department of transport in 1935, Colonel Smart was made deputy minister of the new department.

MARSHALL WILLIAMS, 67, civil engineer who last June retired as assistant to the president of the American Bridge Co., Pittsburgh, died in Pittsburgh Dec. 5. Williams, a graduate of Rutgers University, for a time was assistant engineer at the Pittsburgh Testing Laboratories. In 1901 he joined the American Bridge Co.

SAMUEL STRUMER, 46, civil engineer employed by the New York City Building Department, died at White Plains, N. Y. Dec. 7.

FREDERICK STEELE STRONG, 72, who retired in 1933 as head of the Hornell division of the New York state department of public works, died Dec. 2 in Bath, N. Y.

ALAN W. HOLLIDAY, 25, civil engineering instructor at the University of Wyoming, died Nov. 30.

ARTHUR F. FRY, 72, retired chief engineer of the Harrisburg, Pa., city pumping plant, died in that city recently.

GILBERT E. FAUQUIER, 77, prominent railway and construction contractor of former years in Canada, died Dec. 2 in Ottawa.

MICHAEL MANNELLA, 55, head of the contracting firm of Mannella Construction Co., Pittsburgh, died Dec. 7 in that city.

BENTON F. CROAN, 71, chief engineer for the Hudson Bay Co. in Canada for more than seven years, died Nov. 29 in Seattle, Wash.

ELMER E. TODD, 51, project manager of the National Park Service in Birmingham, Ala., and former engineer with the New Jersey State Highway Department, died in Birmingham Dec. 1.

SAMUEL KLEIN, 56, building consulting engineer employed on the construction of more than 1,200 large buildings throughout the nation, died in Chicago Dec. 5. Klein, a graduate of Armour Institute of Technology, early in life was employed with the engineering department of the Trussed Concrete Steel Co., Detroit, Mich. Later he worked with the Chicago, Milwaukee & St. Paul R.R. and then aided in organizing the Lieberman & Klein firm.

H. C. FRAHM, former chief engineer of the North Dakota State Highway Department and of late assistant to the chief engineer of the North Dakota State Water Conservation Commission, died recently.

CONTRACTS AND CAPITAL

ENGINEERING CONSTRUCTION awards for the week, $81,725,000, top the volume for the corresponding 1939 week by 103 per cent, the fifteenth consecutive week in which current awards have exceeded their respective 1939 values. The week's total is, however, 26 per cent under a week ago.

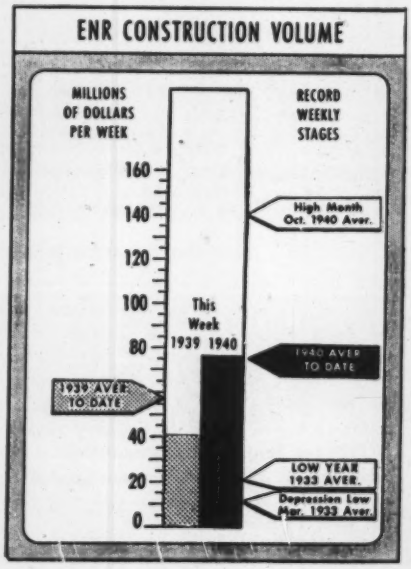
Private construction is 30 and 14 per cent higher, respectively, than last year and last week. Public awards are 158 per cent higher than in 1939, but fall 35 per cent under the preceding week.

The current week's total brings 1940 construction to $3,780,767,000, a 30 per cent increase over the total for the 50-week 1939 period. Private construction is up 27½ per cent. Public awards top last year by 31 per cent as a result of the 295 per cent increase in federal work.

In the classified construction groups, gains over the preceding week are in industrial buildings, and streets and roads. Increases over the 1939 week are in waterworks, industrial buildings, public buildings, streets and roads and unclassified.

New capital for construction purposes for the week totals $97,748,000. This compares with $7,984,000 reported for the corresponding 1939 week. The week's financing is made up of $86,391,000 in state and municipal bonds, and $11,357,000 in corporate security issues.

New construction financing for 1940 to date, $3,877,994,000, is 62 per cent above the total for the period last year.



CONTRACTS

(Thousands of dollars)

	Week Ending Dec. 14 1939	Dec. 5 1940	Dec. 12 1940
Federal	$3,689	$68,374	$41,892
State & Municipal	19,101	22,395	17,253
Total public	$22,790	$90,769	$59,151
Total private	17,368	19,734	22,574
TOTALS	$40,158	$110,503	$81,725
Cumulative 1940	(50 weeks)		$3,780,767
1939	(50 weeks)		$2,910,426

Note: Minimum size projects included are: Waterworks and waterways projects, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

NEW PRODUCTIVE CAPITAL

	1939 50 Wks.	Cumulative 1940 50 Wks.
NON-FEDERAL	$1,259,983	$1,596,033
Corp. Securities	213,203	386,462
State & Mun.	543,419	570,933
R.E.A. loans	89,445	40,000
U.S.H.A. loans	215,811	218,704
R.F.C. loans	8,105	195,912
Fed. Aid-Hwy	190,000	184,000
FEDERAL	$1,128,028	$2,281,961
TOTAL CAPITAL	$2,388,011	$3,877,994

FHA MORTGAGES

	Week Ending Dec. 9 1939	Nov. 30 1940	Dec. 7 1940
Selected for appraisal	$19,324	$20,556	$19,700*
Cumulative 1940	(49 weeks)		$1,212,290*
1939	(49 weeks)		$1,079,161

* Subject to revision.

ENR INDEX NUMBERS

Index Base = 100		1913	1926
Construction Cost	Dec., '40	249.12	119.75
Building Cost	Dec., '40	208.19	112.54
Volume	Nov., '40	331	145

CONTRACT UNIT PRICES

What contractors are bidding on different kinds of construction work

PUMPING STATION SUBSTRUCTURE MEMPHIS, TENN.

OWNER: U. S. Engineer Office, Memphis, Tenn.

PROJECT: Construction of steel sheet piling, foundations, floors, intake conduit, retaining walls, steel discharge pipes, earth fills and appurtenant work in connection with Cypress Creek Pumping Station substructure. Site of work on North Bellevue Blvd. about ½-mile south of Wolf River and about 0.7 miles north of Chelsea Ave. in Memphis, Shelby County, Tenn.

CONDITIONS: Government to furnish structural gates, trash racks, mechanical rakes, pump supports, miscellaneous anchor bolts, dowels, etc., and electric conduits and fittings. Contractor to furnish all other material and complete work in 180 calendar days. Contractor to have use of city streets and county roads. Wage rates specified are: skilled labor, $1.00 to $1.25 per hr.; semi-skilled, 40 to 75c.; and unskilled labor, 35c. per hr.

BIDS: Six bids were opened October 18, 1940, ranging from the contract low of $391,002 to $528,384. Engineer's estimate, $373,048.

LIST OF BIDDERS:

1. Ben M. Hogan, Memphis, Tenn. (contract) $391,002
2. J. T. McCarthy, Davenport, Iowa 405,974
3. J. B. Michael & Co., Memphis, Tenn. 448,516
4. Forcum-James Co., Dyersbury, Tenn. 462,585
5. Midland Constructors, Chicago, Ill. 518,640
6. R. J. Reid Contracting Co., Birmingham, Ala. 528,384

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Excavation	340,000 c. y.	$0.24	$0.29	$0.28
2. Rolled fill	243,000 c. y.	.04	.06	.10
3. Sand backfill	4,000 c. y.	.50	.50	1.00
4. Steel sheet piling, 22# per s. f.	19,000 s. f.	1.05	1.35	1.10
5. Steel sheet piling, 23# per s. f.	12,000 s. f.	1.10	1.35	1.20
6. Steel sheet piling, 38# per s. f.	8,900 s. f.	1.55	1.80	1.95
7. Concrete	6,100 c. y.	17.50	13.70	18.50
8. Reinforcing steel	854,000 lb.	.038	.06	.04
9. Gravel blankets	1,700 c. y.	3.50	4.00	3.70
10. Riprap and gutters	2,700 c. y.	5.00	3.85	10.00
11. Grout	8,000 c. f.	.30	.45	.75
12. Cast iron pipe	70 ton	90.00	120.00	90.00
13. Structural steel	403,000 lb.	.12	.08	.11
14. Miscellaneous metal	12,000 lb.	.25	.16	.19
15. Handrailing	370 l. f.	4.00	1.70	4.80
16. Fence	1,000 l. f.	1.10	1.60	1.40
17. Install struct. steel furn. by Gov't.	211,000 lb.	.025	.02	.0225
18. Gate opening mechanism	L.S.	20,000.00	21,000.00	21,627.00
19. Relief wells	L.S.	1,500.00	2,000.00	2,040.00
20. Tile water gages	70 l. f.	3.00	15.00	3.00
21. Gravel roads	2,200 s. y.	.80	1.80	.50
22. Neat cement grout	100 sacks	4.00	1.50	2.50
23. Core or rotary drilling	30 l. f.	10.00	5.00	.....

SANITARY SEWERS MILWAUKEE, WIS.

OWNER: Town of Greenfield (P. O. Milwaukee), Wis.; H. C. Webster, Milwaukee, engineer.

PROJECT: Construction of 12 miles of 8, 10 and 12-in. vitrified clay sanitary sewers.

CONDITIONS: Weston metal forms and gaskets to be used in making joints. All trenches to be sheathed in accordance with Wisconsin Industrial Code. Prices include manholes. Most of trenches will be in clay. Small portion will be in sand and water. Contractor to furnish all material and complete work by Sept. 1, 1941. Highway transportation facilities available. Wage rates specified are: skilled labor, $1.20 to $1.65 per hr.; and common, $1.00 per hr.

BIDS: Eight bids were opened November 11, 1940, ranging from the contract low of $185,966 to $218,956.

LIST OF BIDDERS:

1. Galliano Orfie, St. Paul, Minn. (contract) $185,966
2. Tomaro & Tomasini, Milwaukee, Wis. 186,108
3. W. J. Lazynski, Inc., Milwaukee, Wis. 190,596
4. Wenzel & Henoch Co., Milwaukee, Wis. 187,942
5. H. Hohensee Constr. Co., Milwaukee, Wis. 202,361
6. F. A. Goll Co., Milwaukee, Wis. 208,649
7. Geo. Carlson Co., Milwaukee, Wis. 209,348
8. Froemming Corp., Milwaukee, Wis. 218,956

Item	Quan.	Unit Prices (1)	(2)	(3)
1. 8-in. vitr. clay pipe, 11-ft. deep	50,669 l. f.	$3.22	$3.10	$3.16
2. 10-in. vitr. clay pipe, 11-ft. deep	4,883 l. f.	2.63	3.70	3.67
3. 12-in. vitr. clay pipe, 12-ft. deep	3,323 l. f.	3.00	3.30	3.78

MISSISSIPPI RIVER BRIDGE MISSOURI AND ILLINOIS

OWNER: St. Louis County, c/o County Court, Judge C. Corneli, presiding judge; Sverdrup & Parcel, consulting engr., St. Louis, Mo.

PROJECT: Toll bridge over Mississippi River between U. S. Highways 61 and 67, St. Louis County, south of Jefferson Barracks, Mo., and U. S. Highway 3, Monroe County, Ill. Highway bridge, with 24-ft. roadway. West approach, two 85-ft. deck plate girder spans; two 135-ft. deck truss spans. Main bridge, 3-span cantilever thru trusses: 670-ft.; 805-ft.; and 670-ft. East approach, five 135-ft. truss spans; and six 60-ft. I-beam spans. Substructure of west approach founded on rock. Pier 5 (west pier for main spans) founded on rock and open cofferdam construction to be used. Piers 6, 7 and 8 on caissons to rock; sealed under air; deepest caisson 85-ft. below low water. East approach founded on piles.

CONDITIONS: Contractor to furnish all materials and complete work in 600 calendar days. Rail, highway and water transportation facilities available. Fabricated structural steel item includes silicon and carbon steel. Wage rates on project are: skilled labor, $1.25 to $2.00 per hr.; semi-skilled labor, $1.00; and common, 80 to 87½c. per hr.

BIDS: Three bids were opened October 28, 1940, ranging from the contract low of $1,852,466 to $2,220,445.

LIST OF BIDDERS:

1. Massman Constr. Co., Kansas City, Mo. (contract) $1,852,466
2. Missouri Valley Bridge & Iron Co., Leavenworth, Kan., and Winston Bros. Co., Minneapolis, Minn. 2,069,416
3. Dravo Corporation, Pittsburgh, Pa. 2,220,445

Item	Quan.	Unit Prices (1)	(2)	(3)
1. Fabricated structural steel	10,840,000 lb.	$0.0969	$0.10	$0.1017
2. Cast steel	110,000 lb.	.17	.20	.20
3. Reinforcing steel	848,000 lb.	.06	.08	.07
4. Concrete in roadway slab	1,170 c. y.	26.00	28.00	40.00
5. Filled grating floor	52,800 s. f.	1.00	1.50	1.50
6. Bituminous fill on curb	7,250 l. f.	.30	.50	.40
7. Conc. in substr.; units 1, 2, 3, 4.	530 c. y.	33.00	50.00	45.00
8. Conc. in shafts of piers 5, 6, 7, 8.	5,440 c. y.	25.00	33.00	30.00
9. Conc. in base of pier 5	265 c. y.	25.00	14.00	70.00
10. Volume in bases of piers 6, 7, 8	7,510 c. y.	45.00	47.60	70.00
11. Concrete, shafts of piers 9 to 13	900 c. y.	33.00	43.00	40.00
12. Conc. in bases of piers 9 to 13.	610 c. y.	15.00	15.00	20.00
13. Conc. in substr. units 14 to 19.	435 c. y.	30.00	50.00	55.00
14. Excav. for abutment 1	1,960 c. y.	2.00	4.00	2.00
15. Excav. for bents 2 and 3	35 c. y.	6.00	6.00	20.00
16. Excav. for bent 4	450 c. y.	7.00	15.50	10.00
17. Excav. for pier 5	860 c. y.	20.00	30.00	10.00
18. Excav. for piers 9 to 13	1,340 c. y.	6.00	11.00	7.00
19. Excav. for substr. units 14 to 19	560 c. y.	2.00	6.50	5.00
20. Sheet steel piling for piers 9 to 13	360,000 lb.	.045	.06	.07
21. Concrete piles	8,460 l. f.	3.00	5.00	4.00
22. Creosoted timber piles	5,040 l. f.	1.25	2.00	1.50
23. Lighting system	L.S.	15,000.00	10,000.00	10,000.00

CONSTRUCTION REPORTS

Compiled by Business News Department—Engineering News-Record, 330 W. 42nd St., New York
ELSIE EAVES, Manager *SCOTT McLEOD, Statistician*
(Daily service also available—Write for details)

Location of ENR Correspondents

Symbols and Abbreviations Include:

† Federal Government
★ Project of $500,000 or over
ENR Engineering News-Record
CD Engineering News-Record Construction Daily

Projects—By Size

Construction projects here reported cover the United States and Canada, are of these minimum sizes or larger: water supply, earthwork, waterworks, $15,000; other public works, $25,000; industrial buildings, $40,000; other buildings, $150,000.

Classes of Construction

(Named in order of Listing)

Water Supply
Sewers, Waste Disposal
Bridges, Grade Cross'gs
Streets & Roads
Earthwork, Waterways
Unclassified
Latin America
Public Buildings
Commercial Buildings
Industrial Buildings

Stages Reported

PROPOSED: (except Streets & Roads):
BIDS ASKED (new announcements only. For full calendar, see also preceding issues of ENR);
LOW BIDDERS: All low bidder news will be the final reports published on the projects involved except where award is not made to the low bidder. In this case, a supplementary contract award report will be published.
CONTRACTS AWARDED: Except awards to low bidders previously reported in low bidder stage.

Dates shown are of issue in which last previous report was published.

WATER SUPPLY

PROPOSED WORK

Conn., Hartford—Metropolitan Dist. Comn., Water Bureau, Hartford, exten. Metropolitan Water Dist. into East Hartford. $455,000. Bond issue approved. C. Saville, 1027 Main St., ch. engr. Water Bureau.

Fla., Miami — C.I. mains, in Biscayne Key. Over $100,000. L. L. Lee, city mgr.

Fla., Miami—Water storage tanks. Over $25,000. L. L. Lee, city mgr.

Fla., Sarasota—WW sys. imprvs. Over $15,000. A. Knight, comr. P. Wks., in charge.

Ill., Rock Island—Imprv. WW. 8 m.g. pump, new boiler, stoker and tank. $25,000.

Ill., Taylorville—J. W. Spresser, mayor, 300,000 gal. water tower. $25,000.

Ia., Goodell—Election Jan. 6, to vote on construction municipal WW sys. $15,000.

Ia., LeClaire—F. G. Meyer, mayor, voted $30,000 bonds, municipal water sys. About $60,000. CD 11/19—ENR 11/21.

Ia., Waterloo—Black Hawk Co., B. Barnes, aud., laying 4,000 ft. 8 in. c. i. watermains, $15,000. R. Stevenson, co. engr.

Ia., Waterloo—Waterloo Water Works, W. J. Lang, mgr., well and pump station. $15,000.

Kan., Little River—WW plant. $53,039. Applied for WPA. Paulette & Wilson, 1006 Kansas Ave., Topeka, engrs.

Minn., Cloquet—J. A. Parks, city clk., voted $25,000 bonds, WW sys. imprvs.

Mo., St. Louis County—Public Water Supply Dist. 1, St. Louis Co., c/o W. J. Becker and W. L. Berthold, attys., 50 S. Central Ave., Clayton, St. Louis, voted to incorporate, and plan bond election water distr. sys. in district to include Washington School Dist. and part of Concord School Dist. $42,000. Robert Francis Denny Co., 8004 Bonhomme St., Clayton, St. Louis, engrs.

Neb., North Bend—J. E. Newson, city clk., iron removing plant. $30,000. Application filed with WPA.

Neb., Omaha—Metropolitan Utilities Dist., 18 and Harney Sts., preliminary plans exten. watermains in southwest section city exten. from 38 and Dodge Sts. to 42 and Pacific Sts. $75,000.

Nev., Reno and **Sparks** — Sierra Pacific Power Co., Reno, imprv., exten. water sys., approx. $150,000.

N. J., Butler—Sheathing, 10 in. c.i. lateral watermains, valves, hydrants, various streets. $38,962. WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. J., Butler—2, 4 and 6 in. c.i. watermains, valves, hydrants in Brook St., Terrace, Fairview and Western Aves. $42,272. WPA. J. F. Sheehan, foot of 5 Ave., Paterson, WPA and owner's engr.

N. Y., New York—Bd. Water Supply, Gas & Electricity, Municipal Bldg., installing 3,500 ft. 12 in. c. i. pipe watermains from Fordham St., City Island to 3 St., Hart's Island. $95,000.

O., Napoleon—Bids in 60 days, installing water softener sys. at municipal waterworks. $15,000-$20,000.

O., Warsaw—Retained Arnold, Rosch & Hartline Co., engrs., New Philadelphia, to make surveys water supply needs, etc. $50,000.

Pa., Beech Creek—Boro Council, expanding, extend. municipal water supply sys. $15,000-$20,000.

S. C., Columbia—Water supply sys. addn. $153,094. Filed WPA application.

Tex., Nixon—J. H. Murphy, mayor, new bids soon WW, deep well, ground concrete storage tank, elevated steel tank and tower, distr. lines, etc. $34,000. Former bids rejected. Beavers & Lodal, Smith-Young Tower, San Antonio, engrs. CD 11/15—ENR 11/21.

Tex., Velasco—E. F. Roeller, mayor, imprv. WW sys. $25,000.

Wash., Bremerton — Rocky Point Water Dist., WW sys. in Phinney Bay Dist., adjacent to city. $100,000.

Wash., Retsil—Gaffner Tracts Water Dist., Retsil, water sys.

W. Va., Triadelphia — Exten. water sys. Over $15,000. E. G. Wickham, mayor.

Wis., Poplar—M. Pechtelkotter, city clk., WW sys. $20,000. L. W. Peleske, Columbia Bldg., Superior, engr.

Man., Winnipeg—Canadian Pacific Ry. Co., J. E. Armstrong, ch. engr. Montreal, Que., waterpipe line for supply to new chemical plant. $50,000.

Ont., Dunnville—Municipality, c/o J. Clark, clk., 90,000 gal. concrete reservoir. E. H. Darling, 36 James St. S., Hamilton, engr.

Ont., Fonthill—A. M. Clark, town clk., WW imprvs., watermains exten. $20,000.

Ont., Malton—National Steel Car Corp. Ltd., 7 Kenilworth St. N., Hamilton, 33,000 ft. 8- to 12-in. watermains.

Ont., Timmins — Municipality, filtration plant. $25,000. J. D. MacLean, Town Hall, engr.

Que., Quebec City—F. X. Chouinard, city clk., water sys. imprvs. $62,400 voted. E. Hamel, City Hall, engr.

Que., Sorel—Sorel Industries Ltd., Sorel, 2 mi. watermains and connection to 100 dwellings, $20,000. F. G. Todd, 1410 Stanley St., Montreal, engr.

Sask., Weyburn—Additional water supply, A. Shattuck, Town Hall, engr.

BIDS ASKED

Bids Asked December 16

Pa., Phila.—Dpt. P. Wks., Bureau Eng., Surveys and Zoning, City Hall Annex, test borings at Belmont filters and Queen Lane filters plants. J. H. Neeson, dir., c/o owner, engr.

Bids Asked December 18

Md., Baltimore—Bd. Awards, City Hall, furnishing, del. brass service pipe fittings to Bureau Water Supply. Water Engineer, Municipal Office Bldg., engr.

Mo., Carrollton—Diesel engine for WW protect. $96,000. Burns & McDonnell, 107 W. Linwood Blvd., Kansas City, Mo., engrs.

Bids Asked December 19

N. C., Rocky Mount—L. B. Aycock, city mgr., WW pump, equip., Nash and Edgecombe Counties, W. C. Olsen, 5 Exchange Pl., Raleigh, engr. CD 11/26—ENR 11/28.

Bids Asked December 30

†Mass., West Springfield—U. S. Eng., 619 Industrial Trust Bldg., Providence, R. I., two 24 in. vertical, mixed-flow volute-type pumps complete with inlet and discharge, piping, gate valves and check valves, etc., adv. ENR 12/12.

Bids Asked January 10

Tex., Abilene—W. Hair, mayor, Abilene, water treating plant addns., and changes. $60,000. R. C. Hoppe, city engr. CD 9/30—ENR 10/3.

LOW BIDDER

O., Ashland—H. S. Lutz, mayor and dir. Pub. Service, Nov. 29, water softening plant, from Hannagan, Inc., Urbana. $49,419. Est. $49,500. CD 11/14—ENR 11/21.

Tex., Anson—J. M. Arnett, mayor, 7.5 mi. supply main, Alternate 1, from B. & M. Constr. Corp., Petroleum Bldg., Oklahoma City, Okla. $52,444. CD 11/12—ENR 11/14.

Que., Longueuil—D. Viger, municipality clk., new water intake and intake well, from Atlas Constr. Co. Ltd., 679 Belmont St., Montreal. $92,500. A. Piamondon, 369 Mount Royal Ave. W., Montreal, engr.

CONTRACTS AWARDED

†Massachusetts — Con. Q. M., First Army Corps, Army Base, Boston, water sys. for fire protection, Fort Standish and Deer Island, to Coughlan Constr. Co., 80 Federal St., Boston. $16,300.

Mass., South Boston (sta. Boston)—Boston Edison Co., 776 Summer St., steel water storage tank, 110 ft. high, 41 ft. diam., to Chicago Bridge & Iron Co., 250 Stuart St., Boston. $33,000. Whitney Eng. Co., 100 Arlington St., Boston, engrs.

Mo., Fayette—G. Todd, mayor, water filtration plant, to Ebbe Constr. Co., Trenton. $32,807. Bids 11/26, awarded 11/28. CD 11/19—ENR 11/14.

N. J., Butler—C.I. watermains, 12 in. valves and 6 hydrants in various streets. WPA. $37,503. CD 11/28.

N. J., Newark—Sheathing, lateral watermains to main line N 6 St. and Meeker Ave., various other streets. WPA. $36,300. W. Banks, City Hall Annex, Newark, city and WPA engr.

Pa., Tyrone—Boro, R. A. Hagerman, burgess, reservoir repairs, WPA. $50,000. J. Funk, Municipal Bldg., engr.

Tenn., Memphis—W. Chander, mayor, additional watermains, WPA. $74,158.

Tex., Highland Park—750,000 gal. elevated steel water storage tank and steel towers, to Pittsburgh-Des Moines Steel Co., 1015 Tuttle St., Des Moines, Ia. $64,400. Bids 11/26. CD 11/7—ENR 11/14.

Ont., Streetsville—J. W. Drennan, municipality clk., drilling test wells for WW imprvs., to J. Hagerty & Son, 378 Bexhill St., Toronto. Total est. $20,000.

Que., Coteau du Lac—A. Pigeon, municipality clk., water pipe line exten., to G. Blanchard, Point Chateau, Vaudreuil. Est. $15,000. O. Beaudoin, 31 St. James St. W., Montreal, engr.

Que., Longueuil—Filtration plant at WW., to Gaspard Archambault Ltd., 726 Atwater Ave., Montreal. $96,800. A. Plamondon, 369 Mt. Royal Ave. W., Montreal engr. CD 11/27—ENR 12/5.

SEWERS, WASTE DISPOSAL

PROPOSED WORK

Calif., Pasadena — Enlarging, modernizing existing sewage disposal plant, incl. aeration